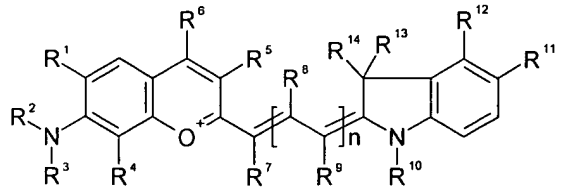
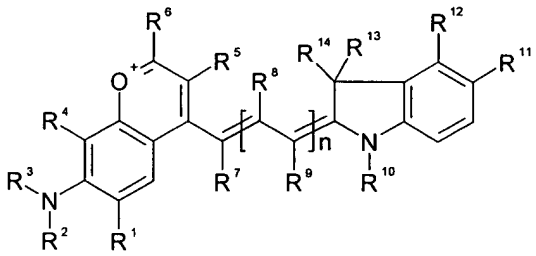
Patent claims

1. Asymmetrical polymethine-based hydrophil markers of general structure **I** or **II**



I



II

where

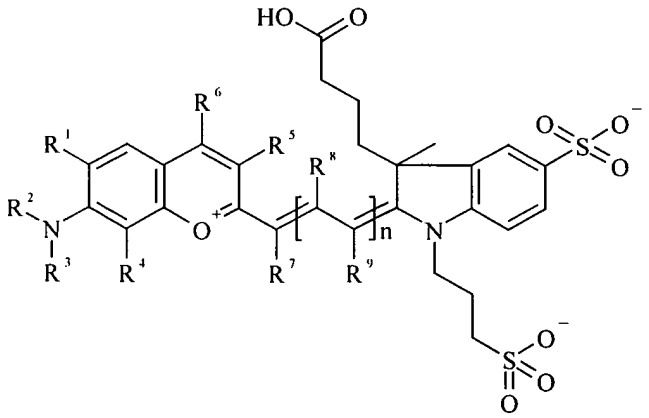
- n stands for numerical values 0, 1, 2 or 3; substituents R^8 and R^9 occurring for n (doubled or threefold for n = 2 or 3 respectively) may be the same or different,
- R^1 - R^{14} are the same or different and may be hydrogen, alkyl-, *tert*-alkyl, aryl-, carboxyaryl-, dicarboxyaryl, heteroaryl-, cycloalkyl-, heterocycloalkyl-, alkyloxy-, alkylmercapto- (with "alkyl" and "cycloalkyl" also including olefin linkage residues), aryloxy-, arylmercapto-, heteroaryloxy-, heteroarylmercapto-,hydroxy-, nitro- or cyano residues and R^1 and R^2, R^2 and R^3, R^3 and R^4, R^5 and R^7, R^9 and R^{10}, R^{11} and R^{12} or R^{12} and R^{13} can form one or more aliphatic, heteroaliphatic or aromatic rings,
- at least one or more of the R^1 - R^{14} substituents may constitute solubilizing or ionizing or ionized substituents such as SO_3^-, PO_3^{2-}, CO_2H, OH, NR_3^+, cyclodextrins or sugars, which determine the hydrophil characteristics of dyes; these substituents may also be linked to the actual basic chromophore by means of an aliphatic or heteroaliphatic or cyclical spacer group, as the case may be,
- at least one of the R^1 - R^{14} substituents may stand for a reactive group, permitting covalent linkage of the dye with another molecule; this substituent may also be linked to the marker dye by means of a spacer function and

- R^6 represents a substituent which, in α position relative to the pyran ring, displays a quarternary or sp^2-hybridized C atom; substituents R^6 and R^5 may also form an aliphatic or substituted aliphatic or aromatic ring system.

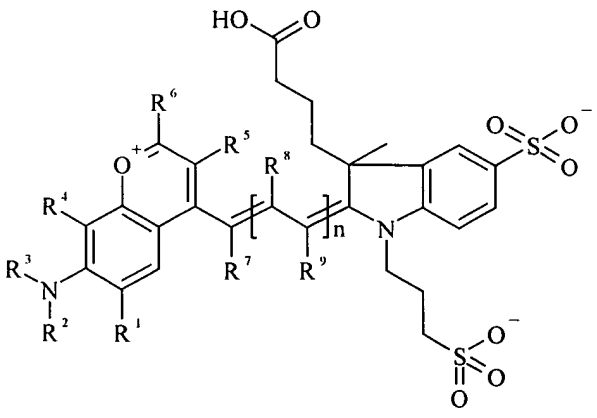
2. Hydrophil markers in accordance with claim 1, a feature of which is that the reactive group is selected from the following functionalities: isocyanates, isothiocyanates, hydrazines, amines, mono- and dichlor or mono- and dibromtriazines, aziridines, sulfonylhalogenides, *N*-hydroxysuccinimide esters, imido-esters, glyoxals or aldehydes for amin- and hydroxy functions or maleimides or iodacetamides for thiol functions and phosphoramidites for the marking of DNA or RNA or fractions thereof.

3. Hydrophil markers in accordance with claims 1 and 2, a feature of which is that the reactive group is linked to the actual chromophore via an aliphatic or heteroaliphatic spacer group consisting of a structural element $[(CH_2)_a\text{-}Y\text{-}(CH_2)_b]_c$, in which Y - the same or different – may be a CR_2-, O-, S-, SO_2, SO_2NH-, NR-, COO or CONR function, with R assuming the functions of R^1 - R^{14} and a and b – the same or different – representing values 0 - 18 and c values 1- 18.

4. Hydrophil markers in accordance with claims 1 - 3, a feature of which is that substituents R^{10} – R^{12} and R^{13} and R^{14} denote the following in the **Ia** or **IIa** structure.



Ia



IIa

5. Use of hydrophil markers in accordance with claims 1 – 4 as dyes for the optical marking of aminoacids, proteins, antibodies, nucleic acids, oligomers, DNA, RNA, biological cells, lipids, polymers, pharmaceutical or polymer particles in qualitative and quantitative optical, and in

particular optical fluorescent, determination procedures, including immune tests, hybridization procedures, FRET systems, chromatographic or electrophoretic procedures and high-throughput screening.

6. Systems for determining the quality and quantity of aminoacids, proteins, antibodies, nucleic acids, oligomers, DNA, RNA, biological cells, lipids, polymers, pharmaceutical or polymer particles, a feature of which is that the functional groups of complexes in accordance with claims 1 – 4 are covalently coupled to an HO-, H_2N or HS function of the substance to be determined.

7. Systems in accordance with claim 6, a feature of which is that the coupling reaction is achieved in aqueous solutions.

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